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FACTS ABOUT

BOSTON HARBOR PROJECT

A MASSACHUSETTS WATER RESOURCES AUTHORITY PUBLICATION – FALL 1996

The construction of $3.4 billion of wastewater treatment facilities, known as the Boston Harbor Project, is the central element in the Massachusetts Water Resources Authority's effort to upgrade the area's sewage treatment system and end Boston Harbor pollution. Construction began in 1989 and is expected to be completed in 1999. The first half (primary portion) of the new sewage treatment plant and a sludge-to-fertilizer plant already are serving communities in MWRA's north-system service area.

PROJECT PLANNING

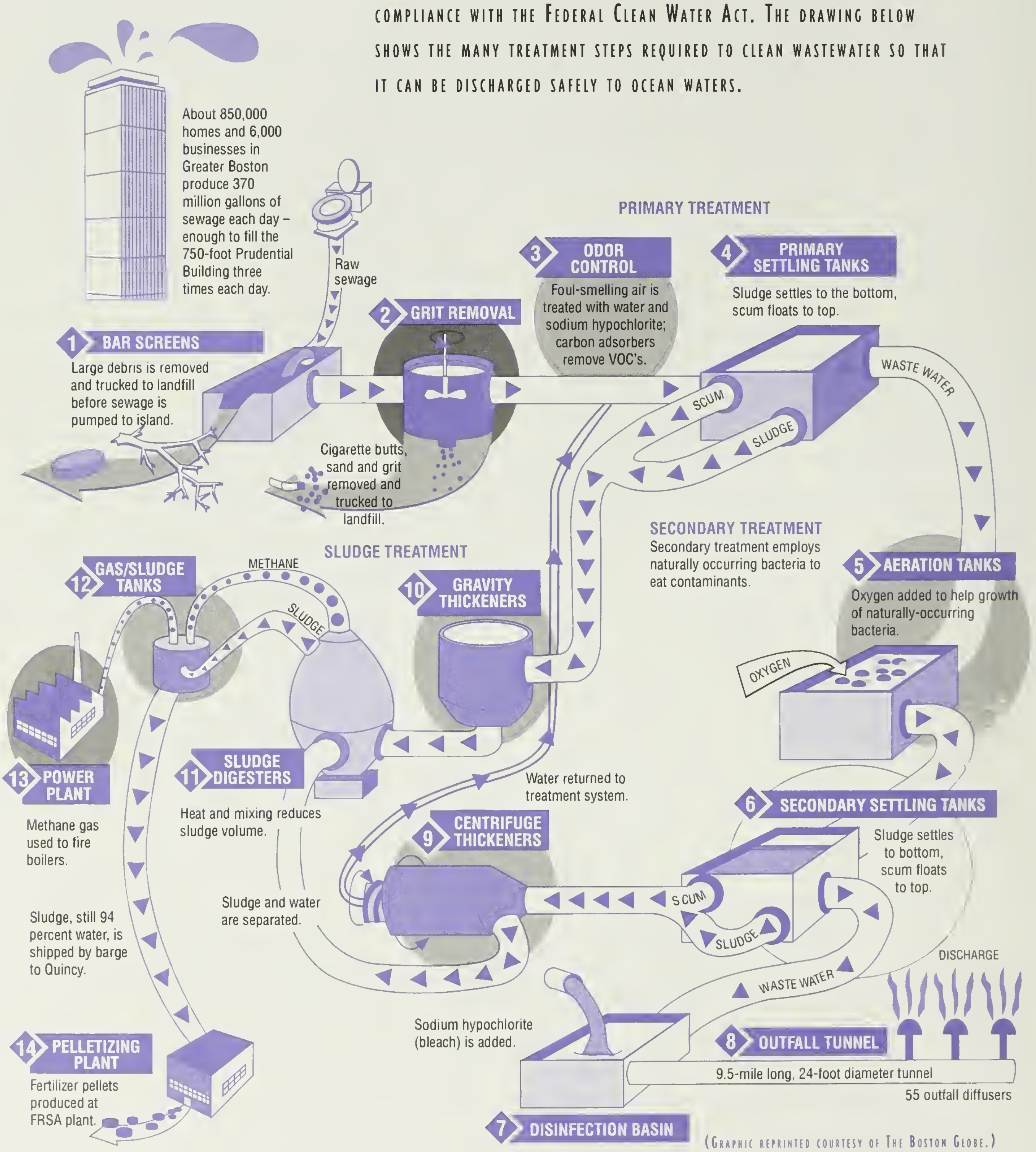
For several decades, Greater Boston's water and sewer services were provided by the Metropolitan District Commission (MDC). In 1985, the Massachusetts Legislature formed the Massachusetts Water Resources Authority (MWRA) and gave the new agency the power to levy its own rates. Historically, the MDC's budget did not contain sufficient funds to maintain existing sewage treatment equipment or to build new facilities.

The court order in the Federal Clean Water Act enforcement action brought by the U.S. Environmental Protection Agency and others to end pollution of Boston Harbor includes specific milestones for completion of new sewage treatment facilities.

Deer Island's landmark sludge digesters are the newest addition to Boston's skyline. The digesters are part of MWRA's Boston Harbor Project.

HOW MWRA'S NEW DEER ISLAND PLANT WILL TREAT BOSTON-AREA WASTEWATER

WHEN COMPLETED, THE MASSACHUSETTS WATER RESOURCES AUTHORITY'S BOSTON HARBOR PROJECT WILL BRING WASTEWATER DISCHARGES INTO COMPLIANCE WITH THE FEDERAL CLEAN WATER ACT. THE DRAWING BELOW SHOWS THE MANY TREATMENT STEPS REQUIRED TO CLEAN WASTEWATER SO THAT IT CAN BE DISCHARGED SAFELY TO OCEAN WATERS.



About 850,000 homes and 6,000 businesses in Greater Boston produce 370 million gallons of sewage each day – enough to fill the 750-foot Prudential Building three times each day.

1 BAR SCREENS
Large debris is removed and trucked to landfill before sewage is pumped to island.

2 GRIT REMOVAL
Cigarette butts, sand and grit removed and trucked to landfill.

PRIMARY TREATMENT

3 ODOR CONTROL
Foul-smelling air is treated with water and sodium hypochlorite; carbon adsorbers remove VOC's.

4 PRIMARY SETTLING TANKS
Sludge settles to the bottom, scum floats to top.

SECONDARY TREATMENT
Secondary treatment employs naturally occurring bacteria to eat contaminants.

5 AERATION TANKS
Oxygen added to help growth of naturally-occurring bacteria.

6 SECONDARY SETTLING TANKS
Sludge settles to bottom, scum floats to top.

7 DISINFECTION BASIN
Sodium hypochlorite (bleach) is added.

8 OUTFALL TUNNEL
9.5-mile long, 24-foot diameter tunnel
55 outfall diffusers

SLUDGE TREATMENT

9 CENTRIFUGE THICKENERS
Sludge and water are separated.

10 GRAVITY THICKENERS
Water returned to treatment system.

11 SLUDGE DIGESTERS
Heat and mixing reduces sludge volume.

12 GAS/SLUDGE TANKS

13 POWER PLANT
Methane gas used to fire boilers.

Sludge, still 94 percent water, is shipped by barge to Quincy.

14 PELLETIZING PLANT
Fertilizer pellets produced at FRSA plant.

(GRAPHIC REPRINTED COURTESY OF THE BOSTON GLOBE.)

THE NEW OUTFALL TUNNEL WILL DISCHARGE EFFLUENT INTO MASSACHUSETTS BAY.

MWRA has met or bettered most of the project's court-ordered milestones, including halting the discharge of floatable pollution and heavier solids (sludge) into Boston Harbor; establishing a water transportation system for workers, equipment and vehicles; beginning primary and secondary plant and Nut Island headworks construction; opening a plant that converts sludge into fertilizer pellets; and beginning primary treatment.

Public review of the project was an essential component in the design. A citizen advisory committee met to review and comment on the Facilities Plan and Environmental Impact Report. The Authority negotiated mitigation agreements with the communities affected by its mammoth construction efforts. Each month, MWRA reports on the project to the federal court. Other citizen groups are currently involved in reviewing plans for the Combined Sewer Overflow Control Plan, which is also part of the federal court order that guides the Boston Harbor Project.

PRIMARY AND SECONDARY FACILITIES

One of the most complex environmental construction projects in the nation, the Boston Harbor Project includes several major components that are being constructed under more than 100 prime contracts and hundreds of subcontracts. During peak construction more than 3,000 workers traveled to Deer Island daily to build the plant.

New 1.3-billion-gallon-daily (bgd) primary and secondary treatment facilities on Deer Island are the project's centerpiece. MWRA designed the new plant to handle wastewater from all 43 of its sewer communities, replacing a primary plant on Deer Island, built in 1968, and one on Quincy's Nut Island, built in 1952.

The first half of the new primary facilities began treating wastewater from northern service-area communities in January 1995. South system flows will reach Deer Island after the inter-island tunnel and the Nut Island headworks are completed. Primary treatment removes 60 percent of solids and up to 40 percent of toxic materials in wastewater and reduces bio-chemical oxygen demand (BOD) by 35 percent. (BOD measures the amount of oxygen used in a body of water by decomposing organic materials. This is a major form of pollution since oxygen in the water supports marine life.) Secondary treatment, scheduled for completion beginning in late 1996, will further purify wastewater by removing 90 percent of solids, 50 to 85 percent of toxins and reducing BOD by 90 percent.

EFFLUENT OUTFALL TUNNEL

Nearly 15 miles of new tunnel are nearing completion as part of the harbor project. The longest, a 9.5-mile effluent outfall tunnel that will discharge treated wastewater (effluent) into the deep waters of Massachusetts Bay, is expected to be completed in 1998. The 24-foot-diameter tunnel is the largest single-entry tunnel in the world.

A diffuser system, consisting of 55 risers, each topped with a mushroom-shaped cap, is already in place on the ocean floor and is being connected to the outfall tunnel's last 1.25 miles. The diffusers will discharge the treated effluent through eight nozzles in each cap to ensure thorough mixing of effluent with seawater.

INTER-ISLAND TUNNEL

Wastewater from MWRA's southern collection system will be conveyed to Deer Island via a five-mile tunnel from a new headworks (screening facility) on Nut Island. The initial boring of the tunnel was completed in November 1995. It is now being lined with cast-in-place-concrete with completion anticipated in late 1997. The tunnel contains a pair of 14-inch-diameter pipes that will eventually be part of a system to carry sludge from Deer Island to the Fore River Staging Area (FRSA) processing plant in Quincy.

NUT ISLAND HEADWORKS

A new headworks being constructed adjacent to the existing Nut Island primary treat plant will provide preliminary treatment for Deer Island-bound wastewater. The sewage entering the headworks will pass through screens and grit chambers that will remove large objects, sand and gravel before the flow is conveyed to Deer Island for primary and secondary treatment.

Nut Island headworks construction began in December 1992 and will be completed in 1997. The existing Nut·Island primary plant will be demolished and the area around the headworks will be landscaped for use as a public park.

SLUDGE DIGESTERS

The construction of twelve 150-foot-high sludge digesters has created an unmistakable new Boston Harbor landmark. Eight of the three-million-gallon digesters have been completed and placed in operation. The remaining four will be completed in early 1997, providing additional capacity to process sludge generated by the secondary treatment plant.

LOCALLY, MWRA SLUDGE FERTILIZER PELLETS ARE MARKETED AS BAY STATE ORGANIC™.

THESE SLUDGE DIGESTERS WERE FABRICATED AT THE FORE RIVER STAGING AREA IN QUINCY.

Deer Island's giant egg digesters use a process called anaerobic digestion. This method encourages the growth of microorganisms that feed on nutrients in raw sludge, reducing its volume and killing most pathogens. After digestion, sludge – now called biosolids – is ready to be processed further for recycling purposes.

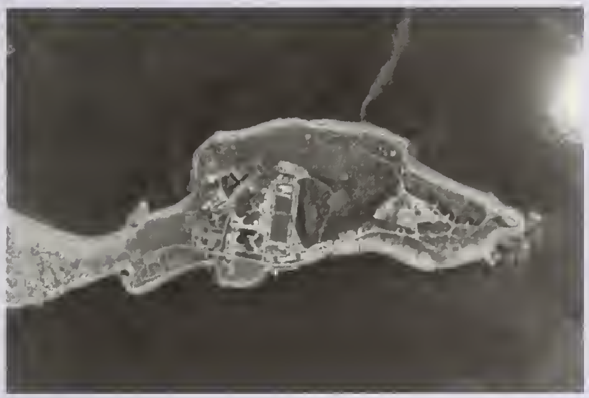
SLUDGE MANAGEMENT

MWRA met a major Boston Harbor Project milestone in 1991 when it closed the valve that released sludge daily to Boston Harbor. This important step was accomplished when the FRSA sludge processing facility was completed and began turning wastewater-treatment residue into fertilizer.

Covered barges carry the biosolids from Deer and Nut Islands to the processing plant, where it is dewatered, heat-dried and shaped into small pellets. MWRA fertilizer pellets are used in Florida and Texas to cultivate citrus products, and are proving popular with New England gardeners and greens keepers who purchase them locally as ***Bay State Organic***™.

COMBINED SEWER OVERFLOWS

Though not as frequent as they used to be, sewer system overflows are still a pollution problem for Boston Harbor and other local waters. Four communities at the downstream end of MWRA's sewer system use the same pipes to



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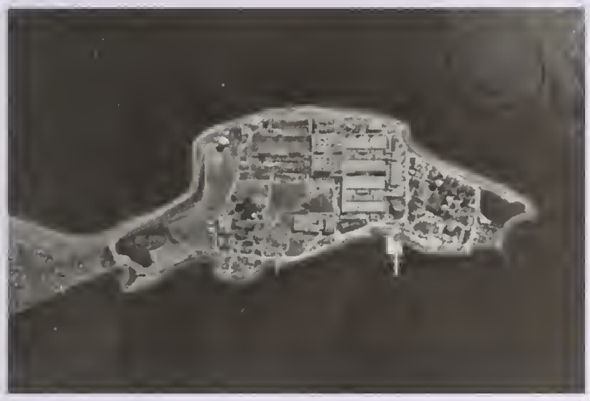

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RESHAPING AN ISLAND

When Boston Harbor Project construction began in 1989, Deer Island looked very different than it does today.

Elements that stood in construction's way included military bunkers constructed during World War II as part of a harbor defense strategy and a hill, or drumlin, a legacy of the coastline's glacial past.

A prison constructed in the 1880s still housed 800 inmates and a wastewater treatment plant provided primary treatment to about half of the Massachusetts Water Resources Authority's sewer-service communities.

Before large-scale construction could get underway, the bunkers were dynamited and bulldozed and the drumlin was moved from the center of the island to the northern edge to shield the community of Winthrop from plant construction and operations. Prison inmates were relocated to the new Suffolk County House of Correction in Boston's South Bay area. The primary treatment plant continued to operate until 1995.

collect both sanitary sewage (from homes and businesses) and stormwater runoff. This is called a combined sewer system. During dry weather, when only sanitary sewage is entering the pipes, the system can handle the flow. In wet weather, the addition of stormwater in pipes causes overflows into the harbor and connecting rivers through combined sewer overflows (CSOs).

In the near term, improved pumping at Deer Island has allowed more flow to reach the plant for treatment instead of spilling out, untreated, into area waters. Dry-weather CSOs have been eliminated and wet-weather spillage has declined 45 percent.

MWRA is completing facilities planning and environmental review for more than two dozen CSO control projects. When these efforts are completed by 2008, 96 percent of all overflows will be treated. The remaining outlets will discharge flow an average of four – or fewer – times a year.

HARBOR WATERS IMPROVE

Even before MWRA's new wastewater treatment facilities were operational, Boston Harbor water quality was already improving. Early steps in the Boston Harbor Project, including better screening, pumping and disinfection, reductions in stormwater entering the system and the end of sludge discharges had put an end to the gross environmental abuses of the past. These steps, which sharply reduced bacterial and solid pollution loads, are allowing the harbor to begin cleansing and restoring itself.

Harbor beaches have become more attractive since MWRA began removing scum (floating pollution, including plastics) and sludge from the effluent. Not only have the clarity, appearance and smell of harbor waters improved greatly, water quality monitoring results indicate a sharp decrease in fecal coliform levels near the old sludge-discharge site.

An aggressive toxic-materials reduction program has helped minimize the flow of these materials into the harbor. Zinc and copper loadings have decreased by at least 75 percent from the early 1980s to the mid-1990s. Key indicators of pesticides and disease in shellfish and winter flounder are declining. Rocky areas near former sludge outfalls were among the first harbor areas to recover – allowing mussels, kelp, sea urchins and anemones to return.

Other improvements will take years to be fully realized. As levels of organic material and toxic chemicals decrease, more species will begin to develop into communities typical of healthy marine environments.

The next major improvements will come with the addition of secondary treatment and the opening of the new outfall tunnel in Massachusetts Bay. In preparation for these events, MWRA, in cooperation with state and federal environmental reviewers, began a massive monitoring program in 1992 to establish baseline (pre-outfall) conditions in Massachusetts and Cape Cod Bays. MWRA will continue to monitor the bays after the outfall begins operating in order to provide early detection of any changes that might occur as a result of the discharges.

MASSACHUSETTS WATER RESOURCES AUTHORITY

The Massachusetts Legislature created MWRA in 1985 to manage water and sewer services for 2.5 million people and 5,500 businesses in 61 communities. While the Boston Harbor Project is the best known of MWRA's projects, the Authority also maintains 400 miles of water pipes, aqueducts and tunnels, and 228 miles of sewers. Also underway are projects to control combined sewer outflows, provide adequate water delivery and meet all federal, state and local water and sewer standards.

THE BOSTON HARBOR PROJECT

MWRA's effort to control the pollution of Boston Harbor is centered around two programs: the Boston Harbor Project and the Combined Sewer Overflow Control Plan.

The Boston Harbor Project is a $3.4 billion, 11-year program to construct new wastewater treatment facilities at Deer Island. When completed at the end of the century, the project will ensure that wastewater discharges from 43 sewer-service communities meet all state and federal standards for protecting public health and the marine environment.

The project includes a new primary and secondary treatment plant on Deer Island; a headworks on Nut Island; a five-mile long tunnel connecting the headworks with the treatment plant and related facilities. A new 27-foot-diameter, 9.5-mile-long tunnel will discharge treated wastewater through 55 diffusers into Massachusetts Bay, ensuring that the effluent is well mixed with sea water.

The CSO Control Plan will reduce pollution from 81 CSOs in the region that can carry a combination of stormwater and sanitary sewage into the harbor and its tributaries during rainstorms. The completed project will reduce the volume of CSO flows by 84 percent over 1988 conditions and provide screening and disinfection to 96 percent of the remaining flow. Many outfalls will be closed or diverted. The plan will result in significant water quality improvements.

MWRA offers a wide variety of informational materials on the region's water and sewer systems and the natural environment. To find out what's available, contact MWRA's Public Affairs Department at:

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